

WINDOWS INTERNET NAME SERVICE

After reading this chapter and completing the exercises, you will be able to:

- ◆ Provide an overview of NetBIOS naming and NetBIOS name resolution
- ◆ Describe the features of the Windows Internet Name Service (WINS)
- ◆ Explain in detail the new features in the Windows 2000 implementation of WINS
- ◆ Install WINS
- ◆ Configure replication between WINS servers
- ◆ Configure a client to use WINS
- ◆ Manage, monitor, and troubleshoot WINS

Networks consisting only of Windows 2000 servers and clients use DNS exclusively for name resolution. However, most modern networks (those consisting of a mixed environment of Windows 2000, Windows NT, Windows 98, and Windows 95) must support NetBIOS name to IP address name resolution. The preferred method for NetBIOS name resolution is the Windows Internet Name Service (WINS). In this chapter, you learn how to install, configure, monitor, and troubleshoot WINS in a Windows 2000 environment.

NETBIOS NAMING

NetBIOS is a Session layer **Application Programming Interface (API)** used by applications to provide an upper-layer interface that is compatible with a multitude of lower-layer networking protocols. For the purpose of this chapter, you focus on the use of **NetBIOS over TCP/IP**, also known as **NetBT**.

Unlike the hierarchical DNS naming scheme, NetBIOS uses a flat namespace. In essence, this means that NetBIOS names can only be used once per machine on a network. Using a **NetBIOS scope** (an identifier added to the NetBIOS name) can overcome this limitation, but few modern networks make use of this parameter. Instead, most networks have a computer-naming scheme to ensure that no two machines have the same NetBIOS name.

Unique NetBIOS names are 16 bytes long and identify both the computer name and certain services running on a computer. An example of a unique NetBIOS name is a computer named win2kdc01. **Group NetBIOS names** identify multiple computers. An example of a group NetBIOS name is a domain named win2kbook. Regardless of the type of NetBIOS name, each consists of up to 15 characters for the computer or group name and a sixteenth character that identifies the particular service. Table 5-1 lists several of the most common unique and group NetBIOS name types.

Table 5-1 NetBIOS names, services, and examples

| Type of NetBIOS Name | Specified Service | Example |
|----------------------|---------------------|-------------------------|
| Unique name | Server service | <i>computername[20]</i> |
| Unique name | Workstation service | <i>computername[00]</i> |
| Unique name | Messenger service | <i>computername[03]</i> |
| Group name | Domain controllers | <i>domain-name[1C]</i> |
| Group name | Domain name | <i>domain-name[00]</i> |

You can view a list of all the services and their corresponding NetBIOS names by issuing the `nbtstat -n` command after the command prompt. The following is a typical response to this command:

```
C:\>nbtstat -n
```

```
Local Area Connection:
```

```
Node IpAddress: [192.168.12.2] Scope Id: []
```

NetBIOS Local Name Table

| Name | Type | Status |
|--------------|-------------|------------|
| WIN2KDC02 | <00> UNIQUE | Registered |
| WIN2KDC02 | <20> UNIQUE | Registered |
| WIN2KCLASS02 | <00> GROUP | Registered |

| | | | |
|-----------------|------|--------|------------|
| WIN2KCLASS02 | <1C> | GROUP | Registered |
| WIN2KCLASS02 | <1B> | UNIQUE | Registered |
| WIN2KDC02 | <03> | UNIQUE | Registered |
| WIN2KCLASS02 | <1E> | GROUP | Registered |
| INet~Services | <1C> | GROUP | Registered |
| IS~WIN2KDC02... | <00> | UNIQUE | Registered |
| WIN2KCLASS02 | <1D> | UNIQUE | Registered |
| .._MSBROWSE_. | <01> | GROUP | Registered |
| ADMINISTRATOR | <03> | UNIQUE | Registered |

Each name in the NetBIOS Local Name Table allows older clients such as Windows NT or Windows 95/98 to locate either services running on a particular machine or resources within a domain. For instance, suppose a Windows 95 machine running TCP/IP needs to connect to a shared file resource on a computer named win2kdc02 with the net use s: \\win2kdc02\sharename command. The Windows 95 machine attempts to connect with NetBIOS over TCP/IP to the win2kdc02[20] NetBIOS name, the computer name with the server service indicator. If the same machine needs to find the domain controllers on a domain named win2kclass02, it sends a request to the NetBIOS name win2kclass02[1C] in an attempt to find the domain controllers for that particular domain. In either of these cases, once found, the NetBIOS name and service must eventually be resolved to an IP address for network communication to occur.

NetBIOS Name Resolution

Windows 2000 supports six different methods for NetBIOS name to IP address resolution. Figure 5-1 shows each method in the order it is used.

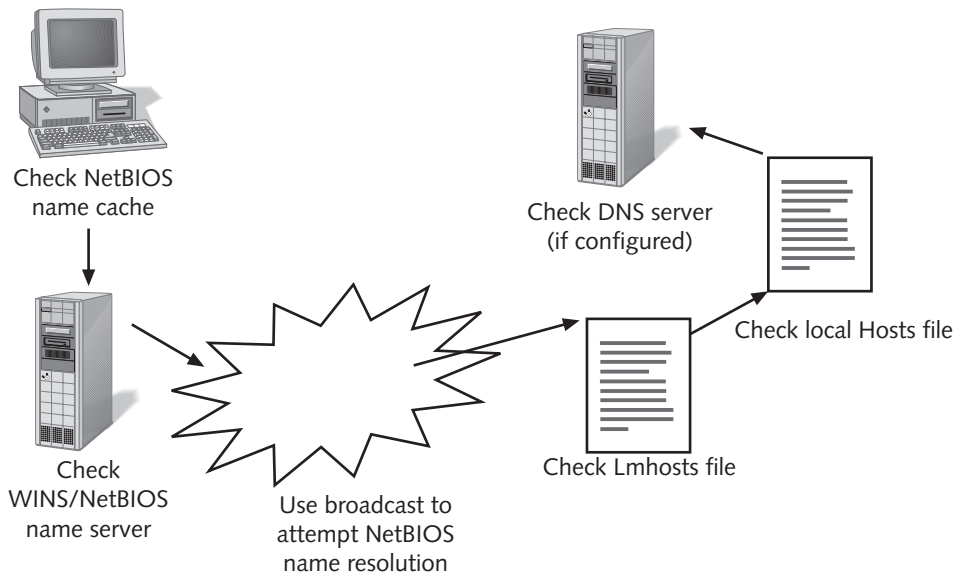


Figure 5-1 Six methods of NetBIOS name resolution in Windows 2000

Although Figure 5-1 shows the general order in which NetBIOS name resolution methods are attempted, clients can be configured with a node type that determines their exact method. Table 5-2 lists the major node types and briefly describes each.

Table 5-2 NetBIOS node types

| Node Type | Description |
|---------------|---|
| b-node | Broadcast node uses broadcasts for all NetBIOS name resolutions; avoid b-node if possible |
| p-node | Point-to-point node configures a machine to use only a NetBIOS Name Server (NBNS) /WINS server for NetBIOS name resolution; works well, but can cause problems if your WINS servers go offline for some reason |
| m-node | Mixed node attempts broadcasts for NetBIOS name resolution first; if no response occurs, a client then uses a p-node request to a NBNS/WINS server; m-node suffers from its excessive use of broadcasts |
| h-node | Hybrid node is the node of choice; clients configured as h-nodes try to resolve NetBIOS names using directed communication with a NBNS/WINS server first and then switch to a b-node if they cannot locate the server |

The easiest way to set the node type for a client is to assign it as a DHCP scope option. Figure 5-2 shows the 044 WINS/NBNS server and 046 WINS/NBT node type. You must set the 044 option to the IP addresses of the WINS servers that you want clients to use. The 046 or node type should always be set to 0x8, the value for h-node. Using h-node on your network ensures that clients first attempt to use directed communication with the WINS server and only use broadcast as a secondary method for name resolution.

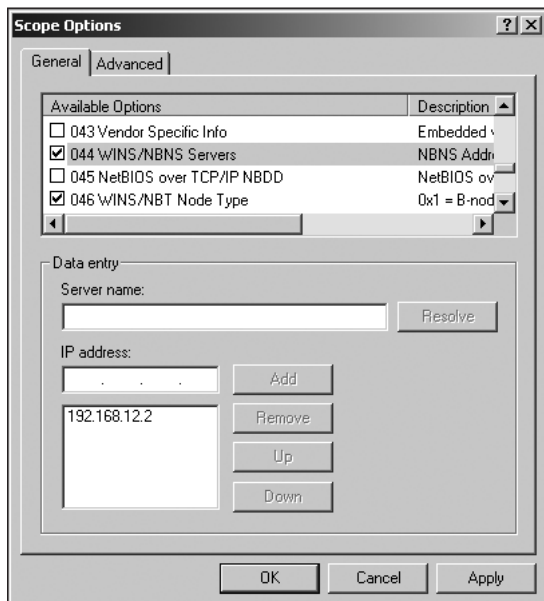
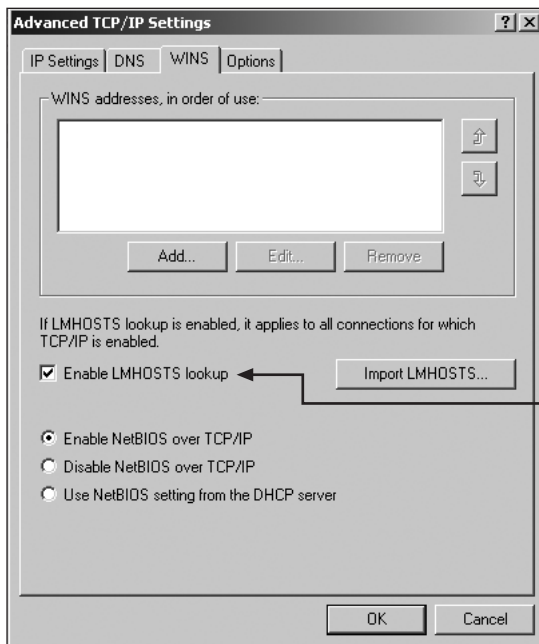


Figure 5-2 WINS scope options in DHCP

If a client is set to use a static IP address, you can also set the WINS servers IP addresses in the TCP/IP properties. This process is covered in detail later in this chapter. Two main methods for NetBIOS name resolution shown in Figure 5-1 are an Lmhosts file or a WINS server. By default, all Windows 2000 clients are configured to use the Lmhosts file if it is present and no other NetBIOS name resolution method can provide resolution. Figure 5-3 shows the dialog box where you enable the Lmhosts file. To open this dialog box, you must access the properties for the Local Area Connection and then double-click the Internet Protocol (TCP/IP) item. In the Internet Protocol (TCP/IP) Properties dialog box, you must click the Advanced button. Finally, click the WINS tab to open the dialog box shown in Figure 5-3.



To prevent use of Lmhosts file for NetBIOS name resolution, do not check the Enable LMHOSTS lookup

Figure 5-3 Disabling Lmhost lookup

The Lmhosts file is a static database of NetBIOS names to IP address mappings. Stored in the `winnt\system32\drivers\etc` folder, its name is `Lmhosts` with no extension. (The most common mistake made working with the Lmhosts file is accidentally assigning it an extension such as `txt`; it must have no extension in order for the system to use it for name resolution.) Windows 2000 contains a sample Lmhosts file. The file contains information concerning the correct syntax for entries. In general, the entries for an Lmhosts file are very simple. You simply type the IP address of the host and then type its NetBIOS name. Optional available parameters are mentioned in the following sample file:

```
# Copyright (c) 1993-1999 Microsoft Corp.
#
# This is a sample LMHOSTS file used by the Microsoft TCP/IP
# for Windows.
#
```

```

# This file contains the mappings of IP addresses to
# computenames
# (NetBIOS) names. Each entry should be kept on an individual
# line.
# The IP address should be placed in the first column
# followed by the
# corresponding computename. The address and the
# computename
# should be separated by at least one space or tab. The "#"
# character
# is generally used to denote the start of a comment (see the
# exceptions
# below).
#
# This file is compatible with Microsoft LAN Manager 2.x
# TCP/IP lmhosts
# files and offers the following extensions:
#
#   #PRE
#   #DOM:<domain>
#   #INCLUDE <filename>
#   #BEGIN_ALTERNATE
#   #END_ALTERNATE
#   \0xn̄ (non-printing character support)
#
# Following any entry in the file with the characters "#PRE"
# will cause
# the entry to be preloaded into the name cache. By default,
# entries are
# not preloaded, but are parsed only after dynamic name
# resolution fails.
#
# Following an entry with the "#DOM:<domain>" tag will
# associate the
# entry with the domain specified by <domain>. This affects
# how the
# browser and logon services behave in TCP/IP environments.
# To preload
# the host name associated with #DOM entry, it is necessary
# to also add a
# #PRE to the line. The <domain> is always preloaded although
# it will not
# be shown when the name cache is viewed.
#
# Specifying "#INCLUDE <filename>" will force the RFC NetBIOS
# (NBT)
# software to seek the specified <filename> and parse it as
# if it were
# local. <filename> is generally a UNC-based name, allowing a
# centralized lmhosts file to be maintained on a server.

```

```

# It is ALWAYS necessary to provide a mapping for the IP
# address of the
# server prior to the #INCLUDE. This mapping must use the
# PRE directive.
# In addition the share "public" in the example below must be
# in the
# LanManServer list of "NullSessionShares" in order for
# client machines to
# be able to read the lmhosts file successfully. This key is
# under
# \machine\system\currentcontrolset\services\lanmanserver\
# parameters\nullsessionshares
# in the registry. Simply add "public" to the list found
# there.
#
# The #BEGIN_ and #END_ALTERNATE keywords allow multiple
# INCLUDE
# statements to be grouped together. Any single successful
# include
# will cause the group to succeed.
#
# Finally, non-printing characters can be embedded in
# mappings by
# first surrounding the NetBIOS name in quotations, then
# using the
# \0xnn notation to specify a hex value for a non-printing
# character.
#
# The following example illustrates all of these extensions:
#
# 102.54.94.97    rhino        #PRE #DOM:networking #net group's
# DC
# 102.54.94.102   "appname \0x14"      #special app server
# 102.54.94.123   popular          #PRE      #source server
# 102.54.94.117   localsrv         #PRE      #needed for the
# include
#
# #BEGIN_ALTERNATE
# #INCLUDE \\localsrv\public\lmhosts
# #INCLUDE \\rhino\public\lmhosts
# #END_ALTERNATE
#
# In the above example, the "appname" server contains a
# special
# character in its name, the "popular" and "localsrv" server
# names are
# preloaded, and the "rhino" server name is specified so it
# can be used
# to later #INCLUDE a centrally maintained lmhosts file if
# the "localsrv"

```

```
# system is unavailable.
#
# Note that the whole file is parsed including comments on
# each lookup,
# so keeping the number of comments to a minimum will improve
# performance.
# Therefore it is not advisable to simply add lmhosts file
# entries onto the
# end of this file.
```

If you want to add an entry for a server with the NetBIOS name win2kdc02 (the identification name found under the Network Identification tab) with the IP address 192.168.12.2, you add the following to the above Lmhosts file:

```
192.168.12.2    win2kdc02 #PRE #DOM:win2kbook
```

The entry maps the IP address to the NetBIOS name and states that this entry should be preloaded into the NetBIOS name cache. Preloading entries into the name cache greatly increases name resolution speed because all clients first check their NetBIOS name cache for an entry for the machine they are trying to resolve. This entry also shows the use of the domain extension. Adding `#DOM:domainname` to the entry associates this particular server with browsing and logon capabilities for the domain specified. In other words, it marks this machine as a domain controller for the domain. Table 5-3 shows some of the more common extensions.

Table 5-3 Lmhosts extensions

| Extension | Function |
|-------------------|---|
| #PRE | Preloads the entry into the NetBIOS name cache |
| #DOM:domainname | Associates the machine in the entry with browsing and logon capabilities for the domain specified; place this on any machine that is a domain controller (The #DOM extension requires the #PRE extension; you must also place the #PRE in front of the #DOM entry in the Lmhosts syntax.) |
| #INCLUDE filename | The include statement normally uses a UNC path to a centrally stored Lmhosts file; if you use the #INCLUDE extension, you do not have to change Lmhosts files on every machine when a change occurs |
| #MH | Specifies that a server is multi-homed (containing more than one NIC) or configured with more than one IP address; this signifies that more than one IP address is assigned to the unique computer name |

Lmhosts file entries should be in the format of IP address, followed by either a space or tab and then the NetBIOS name of the machine you are adding an entry for. You should add another tab after the NetBIOS names before placing any extensions you wish to use. Finally, you must complete the entire entry by pressing [Enter]. Also, unless the # sign precedes an extension mentioned either in the file above or in Table 5-3, the # sign normally designates a comment within the Lmhosts file.

The administrative overhead associated with maintaining Lmhosts files are their main drawback. Since they are static databases, Lmhosts files require changes whenever new computers are added to the network or when IP addresses change. Using the #INCLUDE extension and a centralized Lmhosts file can alleviate some of this administration, but time-stressed administrators need a better method. To meet this need, Microsoft created and continues to provide the Windows Internet Name Service server.

WINS AND NETBIOS

5

WINS allows clients to register their NetBIOS name to IP address mappings in a dynamic database hosted on a WINS server. Each client, upon startup and at certain renewal intervals, contacts the WINS server through a directed communication to inform it of the client's current IP address and NetBIOS name. WINS servers are better than Lmhosts files because they provide a dynamic method to register NetBIOS names to IP addresses (definitely needed in any environment using DHCP for client IP assignment), and they allow clients to use directed communications to a WINS server instead of broadcasts. This second point is extremely important on routed networks, networks consisting of multiple IP subnets divided by routers. If clients on a routed network are configured to use only b-node for NetBIOS name resolution, they cannot resolve NetBIOS names for clients on the other side of a router because routers, by default, do not pass broadcasts. WINS queries, however, are directed communications, from the client IP address to the WINS server IP address. As a result, WINS clients can query WINS servers regardless of the server's location in relation to a router.

NetBIOS Name Registration

Figure 5-4 shows two clients, student1 and student2, as they register with the WINS server.

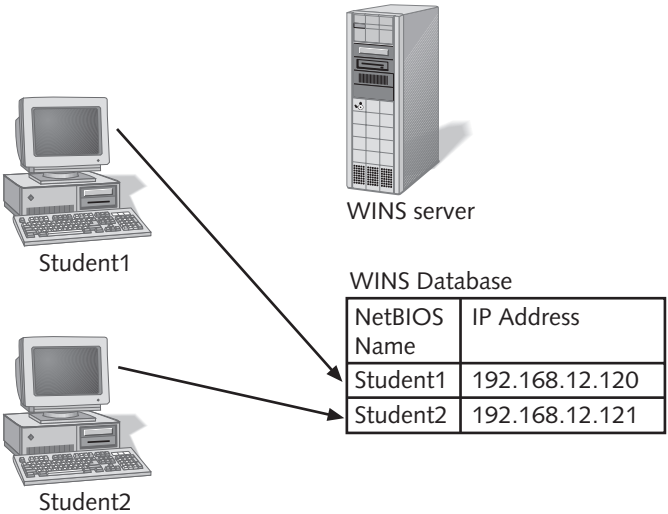


Figure 5-4 Client registration with a WINS server

Clients send a **NetBIOS name registration** request to the configured WINS server stating their IP addresses and NetBIOS names. They request that the WINS server place the NetBIOS name to IP address mappings in the WINS database. If no other machines are currently using the requested NetBIOS names, the clients' requests to the name registration succeeds and they receive a Time to Live (TTL, the amount of time that the registration is valid). WINS clients must renew their name registrations at half the TTL value. This process is discussed in detail later.



Clients actually register more than just the NetBIOS name to IP address mapping. As mentioned earlier, NetBIOS names can be used to distinguish between certain services on a particular machine. A server providing file and print sharing registers its NetBIOS name, plus entries for the server service, messenger service, and possibly many more.

If, during the name registration process for student1 and student2, the WINS server finds a mapping for the requested NetBIOS name already in the WINS database, it sends a challenge to the current owner of the name. If that owner successfully responds, the second client attempting to use that name cannot initialize NetBIOS and may not function correctly on the network. If the current owner does not respond to the challenge, the WINS server allows the second client attempting to use the name to create a new NetBIOS name to IP address entry, thereby taking over use of that NetBIOS name.

NetBIOS Name Renewal

The default TTL is expressed as the renewal interval in WINS properties. The renewal interval is six days by default. Therefore, at halfway through the renewal interval or every three days, the client attempts to renew its NetBIOS name registration with a **NetBIOS name renewal** request. If a client fails to renew its lease (for instance, because the machine cannot contact the primary or secondary WINS servers due to a network outage), the WINS servers eventually release the name registration and make the name available for use by any client that requests it.

NetBIOS Name Release

Clients can also request that a NetBIOS name be released from the WINS database with a **NetBIOS name release** request. This occurs when a WINS client shuts down. At shutdown, WINS clients request a name release from the WINS server. The server replies to each client with a successful release that gives the client a TTL of 0 for the name registration. In other words, the WINS server tells the client that it has released the name.

NetBIOS Name Query

Finally, WINS clients use the WINS server for NetBIOS name queries. In Figure 5-5, student2 wants to connect to a shared resource on student1. Before it can attach, it must resolve the NetBIOS name to an IP address.

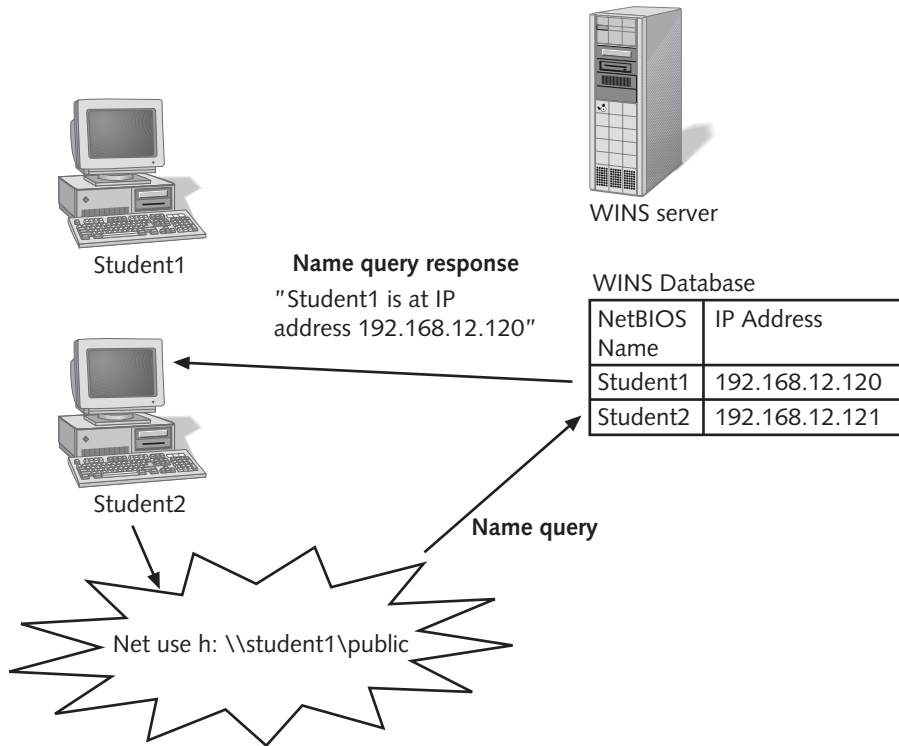


Figure 5-5 Name query and name query response

Student2 sends a **NetBIOS name query** to its configured primary WINS server, asking for a name resolution for student1. The WINS server checks its database and finds an entry for student1's server service. The WINS server then sends a **name query response** back to the client that contains the NetBIOS name to IP address mapping for student1. At this point, student2 can begin the connection process with student1 using TCP/IP.

In short, clients can access WINS servers to perform these four tasks:

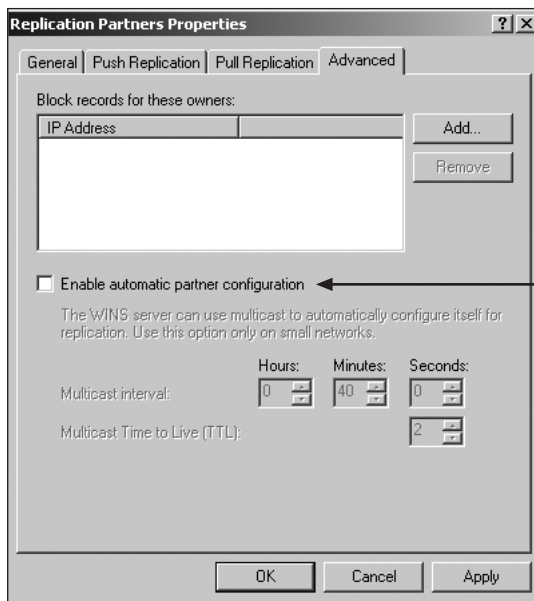
- NetBIOS name registration
- NetBIOS name renewal
- NetBIOS name release
- NetBIOS name query

WINS servers can perform many tasks, but their primary interaction with clients involves either positive or negative name query responses. WINS in Windows 2000 functions almost exactly as it did under Windows NT 4.0. However, some improvements have been added. The next section details some of the new features in WINS under Windows 2000.

WINS IN WINDOWS 2000

Windows 2000 adds several new features to WINS. Most are attempts to make managing and using the WINS server easier. Others are designed to decrease the time used for **WINS replication**, the process of replicating WINS databases between multiple WINS servers. Three major new features are available in the Windows 2000 implementation of WINS:

- *Automatic Replication Partners:* If your network supports multicasting, you can configure Windows 2000 WINS servers to multicast to the IP address 224.0.1.24 to find other WINS servers that can act as WINS replication partners. Once other WINS servers are found, automatic replication is configured between servers. By default, this feature is not enabled, but you can turn it on in the WINS console using the Advanced tab in the Replication Partners Properties dialog box. Figure 5-6 shows this dialog box. If you use automatic replication partners, you must ensure that no unauthorized WINS servers exist on your network. Otherwise, WINS information may be replicated to unauthorized WINS servers.



Selecting Enable automatic partner configuration allows your WINS servers to find and automatically configure WINS replication with other WINS servers on your network

Figure 5-6 Replication Partners Properties dialog box—Advanced tab

- *Persistent connections:* You can now configure Windows 2000 WINS servers to keep a constant connection with replication partners. Keeping a constant connection reduces the overhead caused by opening and closing connections each time replication must occur.
- *Manual tombstoning:* Administrators now can mark an entry in the WINS database as **tombstoned**, or marked for deletion.

These three major changes along with other minor changes all serve to make WINS the preferred method for NetBIOS name resolution on networks running Windows 2000.

INSTALLING WINS

Installing the Windows Internet Name Service is essentially the same process as installing any optional networking component. Before you begin, however, you must ensure that your Windows 2000 server meets the following requirements:

- The server is configured with a static IP address, subnet mask, and default gateway.
- The WINS settings for the server point to its configured IP address. In other words, the WINS settings in the Internet Protocol Properties (TCP/IP) is configured to point to the server's own IP address.

Also, you need to determine exactly how many WINS servers your network needs. At a minimum, every network should have two WINS servers, one as primary and another as backup. These two servers perform replication (discussed later in this chapter) to ensure that their databases always contain the same information.

In general, a primary WINS server and a back-up WINS server should be able to support a network of 10,000 clients.

To begin installing WINS, you must right-click My Network Places and then click Properties. These steps open the Network and Dial-up Connections dialog box shown in Figure 5-7.

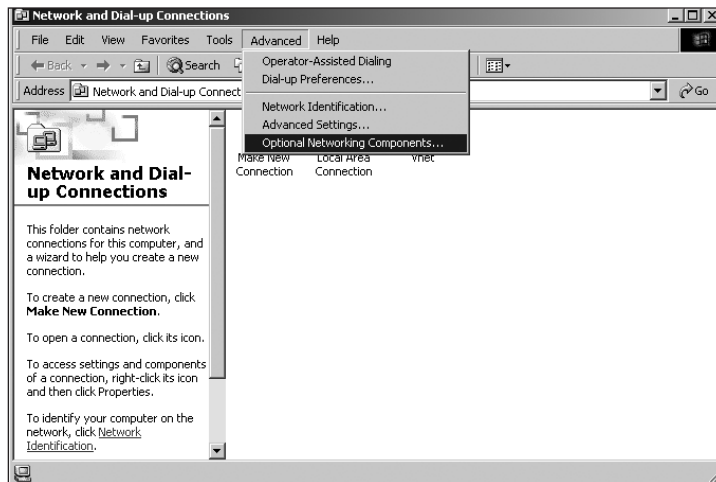


Figure 5-7 Optional Networking Components

Next you must click the Advanced menu item, and click the Optional Networking Components shown in Figure 5-7. The Windows Optional Networking Components Wizard and Networking Services dialog boxes open for use. Figure 5-8 shows both of these dialog boxes.

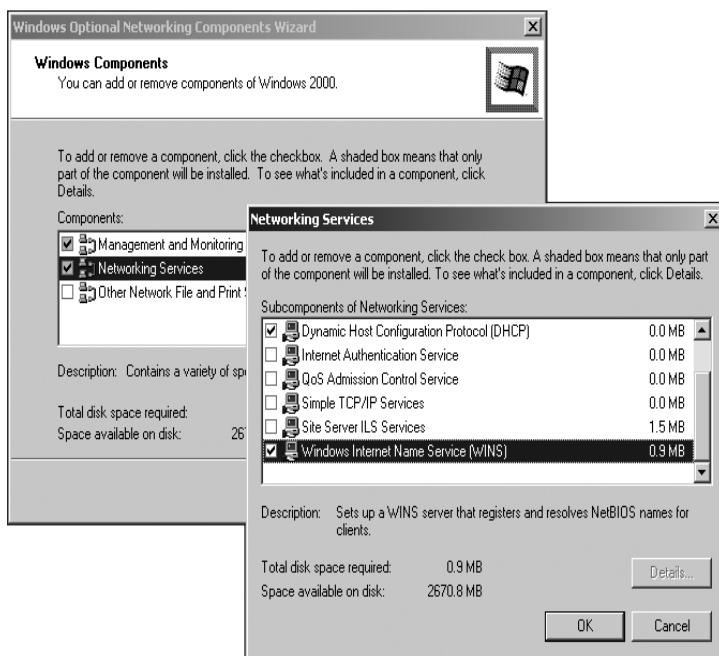


Figure 5-8 Windows Optional Networking Components Wizard and Networking Services dialog boxes

You must click Windows Internet Name Service (WINS) and click OK to install the WINS server. This installs the WINS server service and makes the WINS console available under Administrative Tools. Figure 5-9 shows the WINS console.

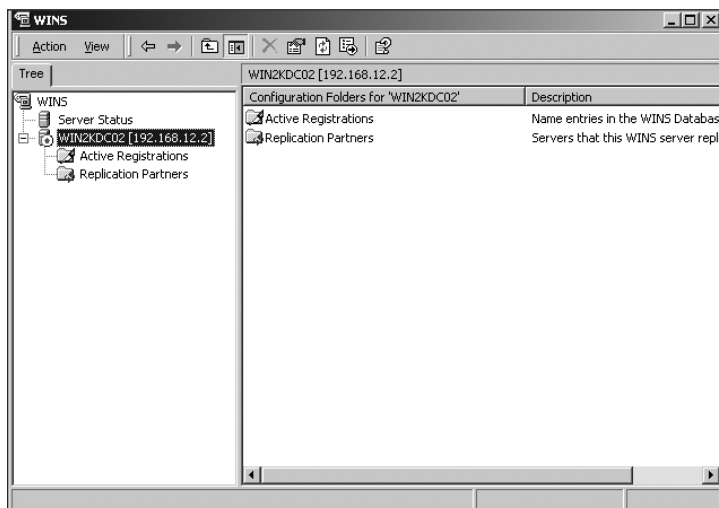


Figure 5-9 WINS console

In the WINS console in Figure 5-9, you can see the WINS server service loaded on the server WIN2KDC02 with the IP address 192.168.12.2. You can also see the Active Registrations and Replication Partners listed as configuration folders. If you click the Active Registrations folder, you see the text shown in Figure 5-10.

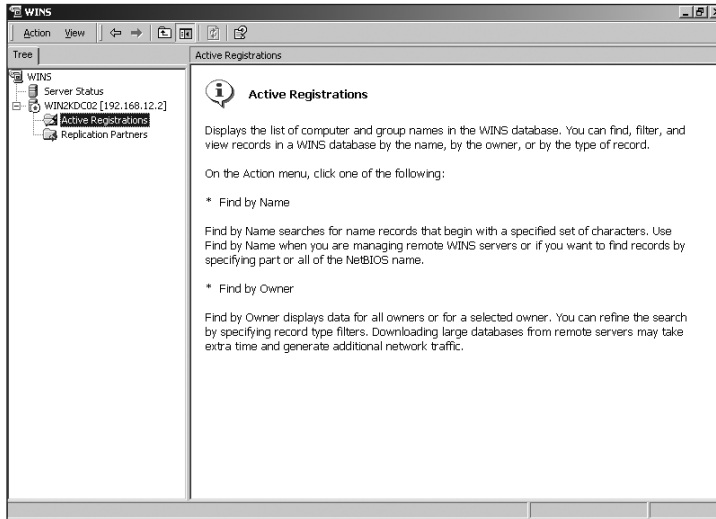


Figure 5-10 Finding active registrations

Administrators accustomed to WINS under Windows NT 4.0 may find it awkward that the entire WINS database does not appear. Instead, Windows 2000 WINS allows you to search by either name or owner. You must right-click on the Active Registrations folder and then click either Find by Name or Find by Owner. The results of your search appear in the right console pane. Figure 5-11 shows the results of a Find by Name search for all entries beginning with “w.”

Now the WINS server is installed and running. Overall, the WINS server requires very little in the way of configuration. In fact, one Microsoft recommendation or best practice for WINS is to always use the default configuration. If you do this and configure your clients correctly, they automatically register their NetBIOS names and IP addresses with the WINS server. On occasion, you may want to add a static entry to the WINS database, usually to provide a WINS entry for a non-WINS client such as a UNIX box. To add a static mapping, you right-click Active Registrations and select New Static Mapping. The New Static Mapping dialog box shown in Figure 5-12 appears. You can use this box to add static mapping for the non-WINS client.

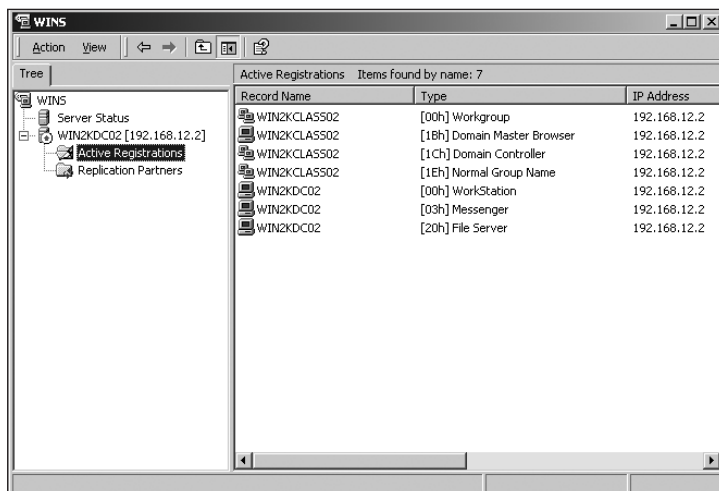


Figure 5-11 Search using Find by Name

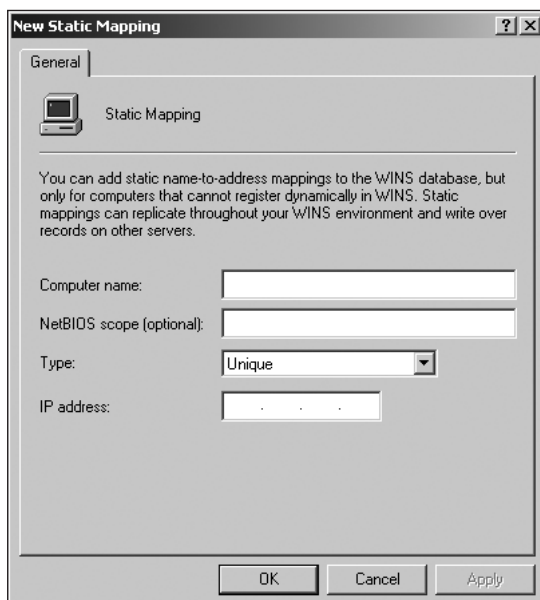


Figure 5-12 New Static Mapping dialog box

CONFIGURING WINS REPLICATION

In a network with more than one WINS server, you must configure the servers to replicate their databases. Otherwise, clients on the network may not be able to resolve certain NetBIOS names. Take, for instance, the network in Figure 5-13.

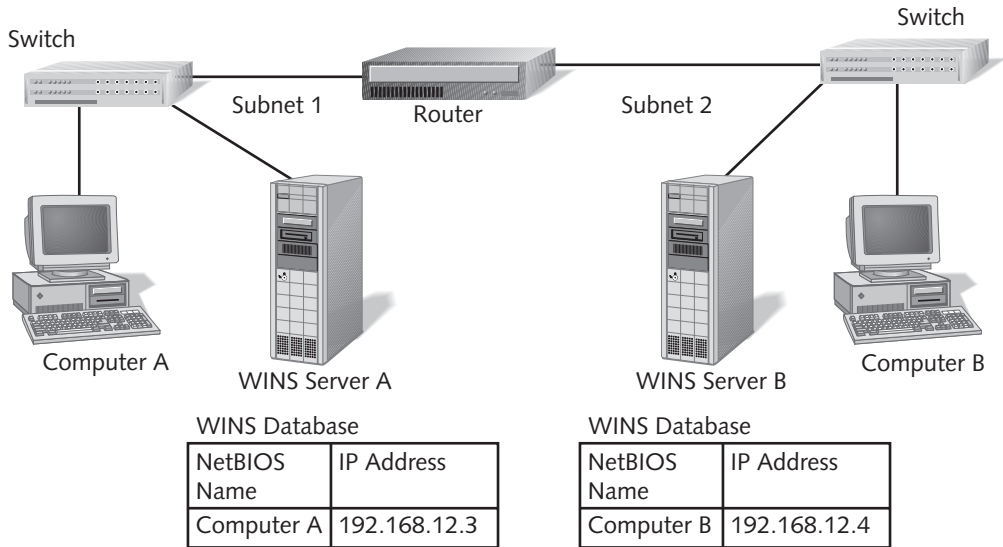


Figure 5-13 WINS replication: sample network

In this network, Computer A on subnet 1 is configured to use WINS Server A, and Computer B on subnet 2 is configured to use WINS Server B. This configuration works perfectly until Computer A attempts to contact Computer B via a NetBIOS name. Computer A performs a name query to WINS Server A for the NetBIOS name to IP address mapping for Computer B, only to get an error stating that the WINS Server A has no mapping for Computer B in its database. Computer A then broadcasts to find Computer B. Since a router separates the two computers, this, too, fails to resolve the NetBIOS name to an IP address. Failed communication between the two computers is the end result.

To fix this problem, you can configure replication between the two WINS servers. All WINS servers in your network should be configured to perform replication with one another. If you establish replication in the network shown in Figure 5-13, Server A learns the NetBIOS name mappings on Server B and vice versa. The end result is a successful name query response when Computer A queries Server A for information regarding Computer B.

You can set up replication partners automatically via multicast. This new feature of Windows 2000 is mentioned earlier in the chapter. In most cases, however, you need to configure replication manually to ensure that it meets the needs of your network. Two types of replication exist for WINS servers: pull and push.

Pull replication occurs at a predetermined interval. You should use it between WINS servers separated by slow links, such as slow WAN links. Using pull replication, you could set the WINS database replication to occur at off hours to conserve WAN bandwidth for data transfer.

Push replication occurs after a predetermined number of changes occur to the WINS database. Since you cannot control when that number of changes will be reached, you should configure push replication between servers that share a fast connection—servers on a LAN segment, for instance.

In most cases, WINS servers are configured as both push and pull replication partners. This ensures that the databases for each server remain consistent.

You configure replication through the WINS console. You must open the WINS console and then right-click the Replication Partners folder. If you select the New Replication Partner option, the dialog box shown in Figure 5-14 opens.



Figure 5-14 New Replication Partner dialog box

You then must type the IP address of the WINS server that you wish to configure as a replication partner, and click OK to continue. You must repeat this process on both servers that you wish to set up as replication partners. By default, the servers are set up as both push and pull replication partners. Figure 5-15 displays the replication partner WIN2KDC01 in the Replication Partners folder.

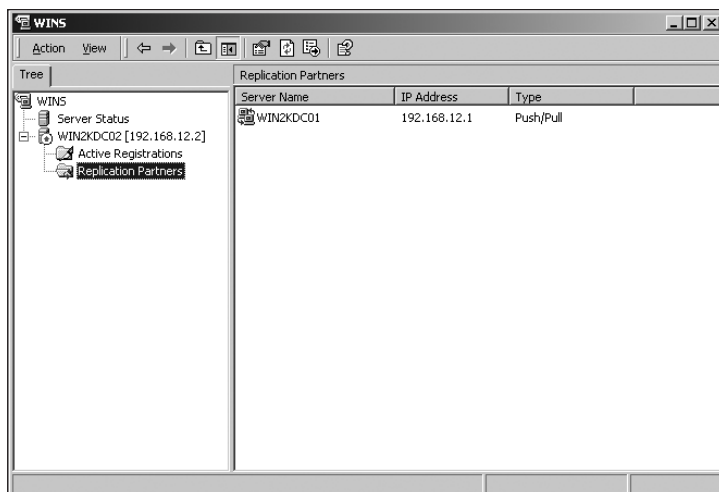


Figure 5-15 Configured replication partner

To configure the push/pull settings further, you can double-click the server in the Replication Partners folder and then select the Advanced tab shown in Figure 5-16. This opens the Advanced properties tab for a particular replication partner. In this tab you can set the interval for pull replication and the number of updates before push replication is triggered. You can also set whether the server uses a persistent connection with its replication partner.

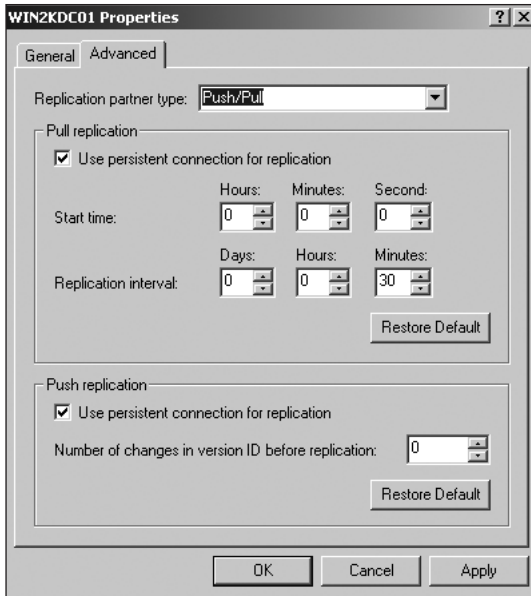


Figure 5-16 Advanced Properties tab for a replication partner

In addition to setting replication parameters and persistent connection settings, you can also use the Replication Partner Type box to configure the replication partners as just push or pull partners only. However, the Microsoft recommendation is that you leave the replication as both push and pull, and adjust the replication parameters to meet your company's needs.

Replication parameters depend on many factors. Some are the number of WINS users, the amount of bandwidth between servers, and the amount of change within your network. You must strike a balance between the least amount of possible WINS traffic and the amount of time you can afford for your databases to be inconsistent.

For example, if the computers in each subnet in the sample network shown in Figure 5-13 rarely need to talk to computers in the opposite subnet, it does not matter if the two WINS server databases are inconsistent for short periods of time. However, if the majority of your traffic occurs between subnets, you must configure your replication parameters to keep the databases as consistent as possible. Replication parameters are more of an art than a science. You probably need to experiment with the replication settings in your environment before deciding exactly what works for your network.

CONFIGURING CLIENTS FOR WINS

The easiest way to configure a client for WINS involves setting the DHCP 044 and 046 scope options mentioned earlier in the section, “NetBIOS Name Resolution,” in this chapter. Using these options guarantees that all DHCP-enabled clients receive the IP address of WINS servers on your network and the correct node type for NetBIOS name resolution.

On clients with static IP addresses, you configure the WINS setting in the Advanced properties, WINS tab of the Advanced (TCP/IP) settings dialog box. Figure 5-17 displays the WINS tab.

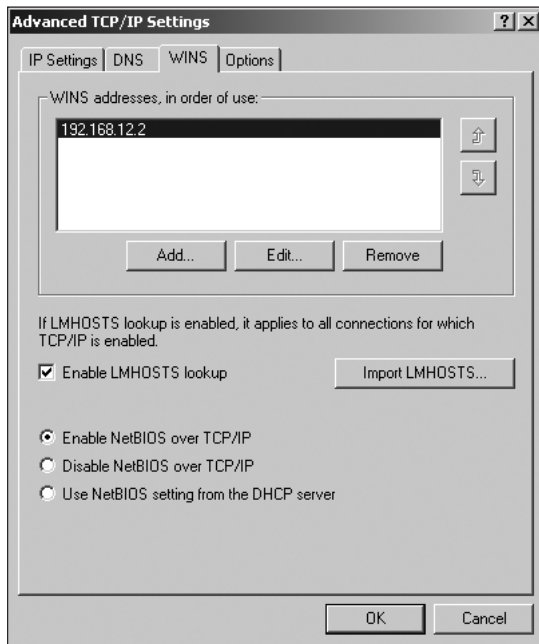


Figure 5-17 WINS tab in Advanced TCP/IP Settings dialog box

Using the various options on this tab you can configure a primary WINS server (the first server in the list) and a secondary WINS server. You can also enable or disable the use of the Lmhosts file. Finally this dialog box allows you to enable or disable NetBIOS over TCP/IP.

For all static clients, you must access the WINS tab and manually type WINS server information. Because this is an enormous administrative task in very large networks, most administrators use DHCP and the DHCP options whenever possible.

MANAGING, MONITORING, AND TROUBLESHOOTING WINS

Due to its dynamic nature, once configured, WINS normally requires very little interaction from the administrator. Still, you should always monitor all services on your network to ensure that they work correctly. The first place to discover WINS errors is the Event Viewer console found under Administrative Tools. The System Log displays any major errors or warnings that the WINS server encounters.

You can find further information about the WINS server service in the WINS console by right-clicking the server and clicking Display Server Statistics. Figure 5-18 shows the server statistics window.

5

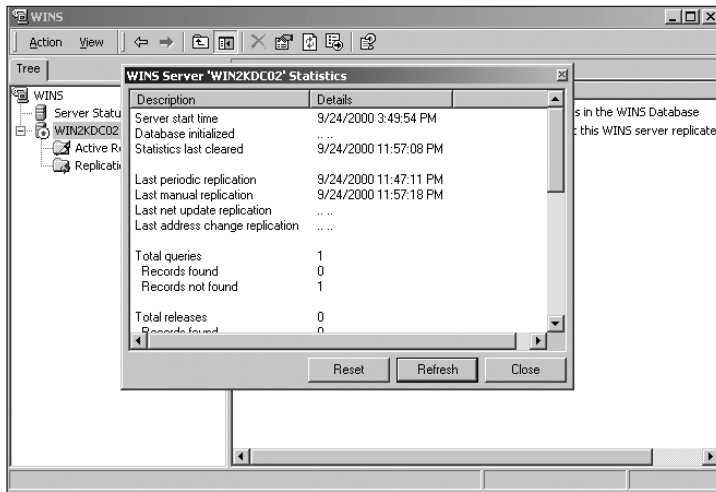


Figure 5-18 WINS Server Statistics window

In the server statistics window, you can see everything from the start time for the server to the last time replication occurred with configured replication partners. If you suspect that replication is not occurring correctly, you should view the WINS partner statistics at the very bottom of the server statistics window. It tells you the # of Replications and the # of Comm failures (communication failures between servers). If you see a high number of Comm failures, the first thing you should attempt is a ping between the two configured replication partners. Network problems may prevent the two servers from seeing each other.

Many other management, troubleshooting, and monitoring tools are also available by right-clicking the server item in the WINS console. Everything from verifying the database to initializing push/pull replication is available. Of particular interest is the Back Up Database item. You can use this to back up the database manually to a particular folder. You can set the default folder path on the General tab shown in Figure 5-19. You access this tab by right-clicking the WINS server and clicking Properties.

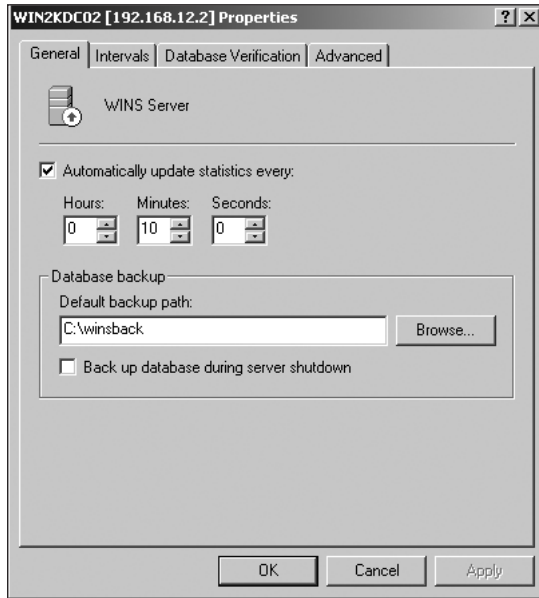


Figure 5-19 Server Properties dialog box

If you click the Backup Database at Server Shutdown shown in Figure 5-19, you guarantee that the WINS database is backed up each time the server shuts down.

To restore a WINS database using the information from a database backup, complete the following steps:

1. Stop the WINS service.
2. Then, navigate to the WINS database directory (%windir%\system32\wins, by default) and delete all files in this directory.
3. At this point, you must open the WINS console, right-click the WINS server, and select Restore Database.
4. Then point the Restore wizard to the directory that holds your backup of the WINS database, and you restore the database.
5. Restart the WINS service.

Most of WINS troubleshooting stems from incorrectly set WINS entries on the client or incorrect DHCP scope options on the DHCP servers. If you do have a client that cannot get NetBIOS name resolutions from a WINS server, first test to see if you can ping the WINS server. Then, verify that the correct WINS settings are in place on the client. Finally, if network connectivity is available and the client is configured correctly, check that WINS server service is running and correctly configured on the server using the tools discussed earlier.

One last management/configuration task may be necessary on a WINS server: compacting the WINS database. If the WINS database grows too large, it can slow name resolution responses. To compact the WINS database, you must use the following commands and syntax:

```
C:\>net stop wins
The Windows Internet Name Service (WINS) service is stopping.
The Windows Internet Name Service (WINS) service was stopped
successfully.
```

```
C:\>cd winnt\system32\wins
```

```
C:\WINNT\system32\wins>jetpack wins.mdb temp.mdb
Compacted database wins.mdb in 1.692 seconds.
moving temp.mdb => wins.mdb
jetpack completed successfully.
```

```
C:\WINNT\system32\wins>net start wins
The Windows Internet Name Service (WINS) service is
starting..
The Windows Internet Name Service (WINS) service was started
successfully.
```

```
C:\WINNT\system32\wins>
```

The `net stop wins` command stops the WINS server service. The `cd` command changes your current directory to the directory that contains the WINS database. The command `jetpack wins.mdb temp.mdb` performs actual compacting of the WINS database. The first `.mdb` database `wins.mdb` is the actual WINS database file. The second `.mdb` specified is just a temporary database used during the compaction process and then erased. The second `.mdb` can have any name, but the first must always be `wins.mdb`. Finally, the `net start wins` command restarts the WINS server service.

CHAPTER SUMMARY

- The Windows Internet Name Service provided with Windows 2000 provides a method for clients to obtain NetBIOS name to IP address resolution. NetBIOS names are 16-byte names that consist of a computer name of up to 15 characters and a sixteenth hexadecimal character that specifies exactly what service is on a computer. In routed LAN environments, WINS servers must be configured to allow clients to perform NetBIOS name resolution properly.
- Although Windows 2000 does support the use of the static `Lmhosts` file for NetBIOS name resolution, the preferred method is the dynamic database used with WINS. With the WINS server installed, clients can be configured to automatically register their NetBIOS names and IP addresses with Name Registration Requests. They can then use name queries to find NetBIOS name mappings on the WINS server.

- In an environment consisting of multiple WINS servers, it is necessary to configure replication properly to ensure that all WINS servers have a consistent database of NetBIOS names on the network. Replication partners can be configured to use pull replication, which replicates the database at a set interval; or push replication, which replicates the database after a predetermined numbers of changes occur. In most networks, replication partners are set up as both push and pull partners.
- Finally, once installed and configured, the WINS server must be monitored. Nearly all monitoring, from displaying the server statistics to backing up the WINS database, occurs within the WINS console. It is the single most important WINS management, configuration, and troubleshooting tool.

KEY TERMS

Application Programming Interface (API) — Standardized set of commands and programming parameters used to simplify the interaction between applications and lower-level networking components.

b-node — NetBIOS node type that uses broadcasts to resolve NetBIOS names to IP addresses.

group NetBIOS names — NetBIOS names used to register entire groups of computers; an example is domain controllers in a domain.

h-node — NetBIOS node type that first attempts directed communication to a WINS server to resolve NetBIOS names to IP addresses; if directed communication fails, clients with this node type then try a broadcast to resolve NetBIOS names to IP addresses.

m-node — NetBIOS node type that first attempts broadcasts to resolve NetBIOS names to IP addresses; if broadcasts fail, the client then tries directed communication with the WINS server.

multi-homed — Any computer configured either with multiple NICs or multiple IP addresses.

name query response — Response sent from a WINS server to the WINS client, either informing the client of the NetBIOS name to IP address resolution or of failure to achieve a resolution.

NetBIOS — Session-level API developed to provide high-level applications with easy access to lower-level networking protocols.

NetBIOS name registration — Sent by WINS clients to WINS servers to ask for registration of a particular NetBIOS name with an IP address.

NetBIOS name release — Sent by WINS clients to direct the WINS server to terminate the dynamic mapping of a NetBIOS name to an IP address.

NetBIOS name renewal — Sent by WINS clients to request that the WINS server extend NetBIOS name to IP address mapping; normally occurs halfway through the TTL.

NetBIOS name query — Used by WINS clients to query WINS servers for information about a particular NetBIOS name; in short, used to find NetBIOS name to IP address mappings.

NetBIOS Name Server (NBNS) — Server configured with the WINS server service.

NetBIOS over TCP/IP — NetBIOS using TCP/IP as its lower-level networking protocol stack.

NetBIOS scope — Optional parameter used to break NetBIOS domains into smaller sections; similar to subnets in TCP/IP.

NetBT — Common abbreviation for NetBIOS over TCP/IP.

p-node — NetBIOS node type that uses directed communication to a WINS server to resolve NetBIOS names to IP addresses.

pull replication — Replication of the WINS database that occurs at a preset time interval; used with slow WAN links.

push replication — Replication of the WINS database that occurs after a predetermined number of changes to the database occur; used with fast connections between replication partners.

Tombstoned — State of a WINS entry once it is marked for deletion.

unique NetBIOS names — NetBIOS names assigned to a single computer and its associated services.

WINS replication — Process of replicating the WINS databases between two WINS servers.

REVIEW QUESTIONS

1. Push replication occurs _____.
 - a. After a certain number of changes occur
 - b. Automatically without administrator intervention
 - c. At a preset time interval
 - d. Never
2. Which one of the following Lmhosts extensions indicates that a computer is multi-homed?
 - a. #PRE
 - b. #MH
 - c. #DOM
 - d. #INCLUDE
3. Which of the following use broadcast for part of their NetBIOS name resolution methods? (Choose all that apply.)
 - a. B-node
 - b. P-node
 - c. H-node
 - d. M-node

4. A computer name is considered a _____ NetBIOS name.
5. A group name is considered a _____ NetBIOS name.
6. Which one of the following commands can you use to see the current NetBIOS names on a machine?
 - a. Nbtstat
 - b. Hostname
 - c. Winsconfig
 - d. Set Wins=auto
7. What Lmhosts extension can you use to preload entries into the NetBIOS name cache?
 - a. #DOM
 - b. #INCLUDE
 - c. #LOADNET
 - d. #PRE
8. Clients attempt NetBIOS name renewal at _____ their TTL.
9. Pull replication occurs _____.
 - a. After a certain number of changes occur
 - b. Automatically without administrator intervention
 - c. At a preset time interval
 - d. Never
10. Which one of the following commands allows you to compact the WINS database?
 - a. Net stop
 - b. Jetpack
 - c. Compact wins
 - d. Set wins=compact
11. Which of the following must you have in order to install the WINS server service? (Choose all that apply.)
 - a. A static IP address, subnet mask, and default gateway
 - b. A Windows 2000 professional machine
 - c. 650 MB free hard-drive space
 - d. A Windows 2000 server machine
12. The preferred NetBIOS node type for all clients is _____.
13. Every network should have at least _____ primary WINS server(s) and _____ secondary WINS servers(s).

14. The 044 DHCP scope option lets you configure WINS/NBNS information that can be dynamically assigned to all DHCP clients. True or false?
15. Which one of the following do WINS clients use to find a NetBIOS name to IP address mapping on a WINS server?
 - a. Name registration
 - b. Name renewal
 - c. Name release
 - d. Name query
16. Which one of the new features in WINS under Windows 2000 reduces the amount of network traffic used for database replication?
 - a. Push/pull replication
 - b. Persistent connections
 - c. Automatic replication partners
 - d. None of the above
17. Which of the following are possible methods that clients can use for NetBIOS name resolution? (Choose all that apply.)
 - a. Broadcasts
 - b. NBNS/WINS servers
 - c. DNS servers
 - d. All of the above
18. A WINS entry with the syntax *computername*[20] specifies which service on the computer?
 - a. Workstation
 - b. Messenger
 - c. Domain controller
 - d. Server
19. You can configure the WINS server to back up the database automatically each time the WINS server shuts down. True or false?
20. WINS replication must be configured on both servers you wish to participate in replication. True or false?

HANDS-ON PROJECTS

All Hands-on Projects in this chapter require two computers set up as described in the lab set-up section in the front of this book. For these exercises, you use the PCs named win2kdc01 and win2kdc02.



Project 5-1

To install the WINS server service:

1. Log on to the **win2kclass02** domain at computer win2kdc01 as **Administrator** with the password **password**.
2. Right-click **My Network Places** and select **Properties** to open the Network and Dial-up Connections dialog box.
3. Click **Advanced** and then click **Optional Networking Components**.
4. Double-click **Networking Services** to display a list of available services.
5. Click in the box to the left of the **Windows Internet Name Service (WINS)** item, and then click **OK**.
6. Click **Next** to install the WINS server service. (You may be prompted to insert your Windows 2000 server CD-ROM.)

You installed the WINS server service on win2kdc01.

7. Repeat this procedure on win2kdc02.



Project 5-2

To configure replication between two WINS servers:

1. On the server win2kdc01 click **Start, Programs, Administrative Tools, WINS**.
This opens the WINS console.
2. Right-click the **Replication Partners** folder, and select **New Replication Partner**.
3. In the New Replication Partner dialog box, place the IP address of win2kdc02 (it should be 192.168.12.2) in the WINS server entry, and then click **OK**.
4. On the server win2kdc02 click **Start, Programs, Administrative Tools, WINS**.
This opens the WINS console.
5. Right-click the **Replication Partners** folder, and select **New Replication Partner**.
6. In the New Replication Partner dialog box, place the IP address of win2kdc01 (it should be 192.168.12.1) in the WINS server entry, and then click **OK**.

At this point, you have configured servers win2kdc01 and win2kdc02 to replicated WINS database information.



Project 5-3

You can complete this Hands-on Project for either server.

To initiate a transfer of WINS database information between replication partners:

1. On the server click **Start, Programs, Administrative Tools, WINS**.
This opens the WINS console.
2. Right-click **Replication Partners** and select **Replicate Now**.

3. Click **Yes** in the Are you sure you want to start replication now? dialog box.
4. Click **OK** in the next dialog box.
5. On the server click **Start, Programs, Administrative Tools, Event Viewer**.

This opens the Event Viewer console.

Event Viewer should contain an entry stating that replication occurred. It may take some time for this entry to appear.

5



Project 5-4

You can complete this Hands-on Project for either server.

To display WINS server statistics:

1. On the server click **Start, Programs, Administrative Tools, WINS**.
This opens the WINS console.
2. Right-click the **server name** in the WINS console, and then select **Display Server Statistics**.
3. Note the Server Start Time, Time of last replication, Total number of queries, and the WINS partner information (# of Replications and # of Comm Fails).



Project 5-5

To set up automatic WINS database backup on the WINS server:

1. Open Windows Explorer and create a folder named **winback** on the systemroot drive.
2. On the server click **Start, Programs, Administrative Tools, WINS**. This opens the WINS console.
3. Right-click the **server name** and then select **Properties**.
4. On the **General Tab** click **Browse**, select the **systemroot\winback** folder as the Default Backup path, then click **OK** to select the path.
5. Click the **Back up database during server shutdown** check box to ensure that the database is backed up when the server is shutdown.



Project 5-6

To initiate a manual backup of the WINS database:

1. On the server click **Start, Programs, Administrative Tools, WINS**.
This opens the WINS console.
2. Right-click the **server name** and select **Back Up Database**. If you completed Hands-on Project 5-5, you are prompted to save the backup in systemroot\winback, the folder specified in Step 4 of that project.
3. Click **OK** to back up the WINS database.

CASE PROJECTS



Case 1

Your boss sends you an e-mail, upset that WINS is still running after he spent thousands of dollars to purchase and install Windows 2000 servers. Reply to his e-mail, explaining why you are still running WINS on your network, which consists of all Windows 2000 servers and Windows 2000 and Windows 98 clients.



Case 2

Your network consists of a central office and three remote sites connected by ISDN. The number of clients in the entire network totals 500. You need to prepare a short, one-page document describing the best way for your network to implement and use WINS. Be sure to include the number of WINS servers you need and how you plan to configure replication.



Case 3

As senior engineer for Freytech Inc., one of your major tasks is providing training for new hires and existing junior-level engineers. Once again, upper-level management has chosen you to provide the Friday afternoon training session. Prepare a 15-minute presentation describing NetBIOS names and NetBIOS name resolution methods. Be sure that you cover both Lmhosts files and WINS servers.